A plate tectonic and palefacies model of the Eastern European Platform in Poland – basic concepts

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Due to the proved potential of the Ordovician and Silurian shales deposited along western edge of the East European Craton as a target for unconventional hydrocarbon prospecting, an effort was undertaken to construct a plate tectonic model enriched with facies maps. The purpose of such a modelling is better understanding of the Lower Paleozoic unconventional hydrocarbon system evolution. The theoretical modelling of upwelling zones as well as borehole data confirm a high TOC values, which is crucial for unconventional deposits.

To create a combined plate tectonic and facies model a GPlates software were used. This software is an opensource computer program dedicated to plate tectonic modelling and visualization. Because it also supports GIS functionality, this software was chosen for a model set up.

During the first stage of model set up, a wander path of Baltica was updated based mainly on published paleomagnetic studies (Torsvik et al., 2012). Also outlines of smaller tectonic units (terranes), such as Małopolska Block or Brunovistulicum, were determined and incorporated into the tectonic model. In the second step, published present day facies maps of Ordovician, Silurian and Devonian deposits as well as paleoextent and paleothickness maps (Modliński, 2010) were digitalized and rotated to the paleoposition.

The Eastern European Platform belonged to the Baltica plate, which originated as a result of disintegration of supercontinent Pannotia. Between Gondwana, Baltica, Avalonia and Laurentia, a large longitudinal oceanic unit, known as the Rheic Ocean was formed. Avalonia was probably sutured to Baltica by the end of Ordovician or in the Early Silurian. This process was dominated by a strike-slip suturing of the two continents, rather than by full-scale continent-continent collision. Silurian was a time of Caledonian orogeny, closing of Early Paleozoic oceans, collision of Baltica with Avalonia and Laurentia and origin of supercontinent Laurussia. The organic rich facies were deposited in a foredeep - type basin, which can be subdivided into three zones (from North to South), i.e: Koszalin – Chojnice, Podlasie and Lublin Zone.

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